UKKW25 QI abstract Leeds – acid

Abstract Title   **Reducing unnecessary carbon in haemodialysis by optimising dialysate acid concentrates**
Theme   *Sustainability*
Abstract Body
Our centre has undertaken efforts to reduce the carbon emissions associated with haemodialysis, focusing on switching from a 1:34 to a 1:44 dialysate acid concentrate. This project was guided by participation in Kidney Quality Improvement Partnership (KQIP) workshops and Trying to Reduce UnNecessary Carbon in Haemodialysis (TRUNC-HD) regional meetings.   Stakeholder analysis, process mapping, and a prioritisation matrix were used to identify impactful changes. The project began with a single unit with clear prior communication to nursing and clinical staff to ensure readiness. Coordination with manufacturers, delivery team, materials management, and haemodialysis staff facilitated a smooth transition. Weekly acid usage was tracked, and a target date set for the switch to minimise 1:34 acid wastage. The implementation process involved confirming machine compatibility, ordering 1:44 acid and ceasing 1:34 orders, updating prescriptions, technicians preparing the system for the new acid and redistribution of leftover 1:34 acid canisters to other units. An after-action review was conducted to refine processes and integrate lessons learned before implementation in the next chosen haemodialysis unit. This iterative approach ensures a smooth transition with minimal disruption.   The unit has 54 patients on centralised acid delivery (CAD), with an average dialysate flow rate of 420 ml/min, requiring 100.8L of dialysate per dialysis session. To produce this, 2.88L of 1:34 or 2.24L of 1:44 acid concentrate is needed per session, with weekly volumes of approximately 466L and 362L, respectively. Weekly monitoring of the acid tank levels demonstrated that weekly acid usage averaged at 500L on 1:34 acid. After changing to 1:44 acid, acid usage was approximately 350L, aligning with the predicted requirement.   Annually, this shift reduces central acid usage by 5391L, lowering delivery weight by 5315kg. Switching to 1:44 CAD and canisters reduces greenhouse gas emissions by 278kgCO_2e (Table 1). Delivery frequency is also expected to decrease from weekly 500L deliveries of 1:34 acid to 3000L deliveries of 1:44 acid every two months. While bulk 1:44 acid is costlier per litre (£500/1000L vs. £420/1000L for 1:34 acid), reduced volume requirements result in projected savings of £1000 annually (Table 2). Six patients who were on 1:34 acid canisters were switched to appropriate 1:44 formulations. As 1:44 canisters are cheaper (£2.85 vs. £3.00 for 1:34), this saves £140.40 annually.   This initiative is currently being expanded to six additional haemodialysis units in our organisation, with projected environmental saving of 3844kgCO2e and financial savings of

£10261 annually. Challenges in monitoring and implementation include limited accuracy in assessing tank levels as tanks are marked in 500L increments and restricted access to CAD storage areas in some units. Improved access and awareness have facilitated better monitoring of tank levels. In addition, baseline assessment uncovered wastage at one unit due to over-ordering, highlighting the importance of adjusting orders to match demand.

This project highlights the environmental and financial savings of switching to 1:44 acid concentrate and provides a replicable model for carbon reduction for in-centre haemodialysis. Lessons learnt include the importance of baseline assessments, continuous process improvements and stakeholder engagement to achieve sustainable practices in healthcare.

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Table 1: Annual greenhouse gas savings of switching to 1:44 acid concentrate in a haemodialysis unit

Manufacturing emissions	**Carbon factor**	**Volume of acid required (L)**		**Total emissions ($kgCO_2e$)**
1:34	0.121$kgCO_2e$/L	25000		3025
1:44	0.154$kgCO_2e$/L	19000		3096
Difference				-71
Transport emissions of delivering bulk central acid	**Carbon factor for freight and well-to-tank of average laden HGV Diesel (7.5 - 17 tonne)**	**Weight of acid delivered (tonne)**	**Distance of delivery (km)**	**Total emissions ($kgCO_2e$)**
1:34	0.47269 $kgCO_2e$/tonne.km	29.2	102	1408
1:44	0.47269 $kgCO_2e$/tonne.km	23.0	102	1118
Difference				290
Transport emissions of delivering acid canisters	**Carbon factor for freight and well-to-tank of average laden HGV Diesel (7.5 - 17 tonne)**	**Weight of acid delivered (tonne)**	**Distance of delivery (km)**	**Total emissions ($kgCO_2e$)**
1:34	0.47269 $kgCO_2e$/tonne.km	6.83	102	329
1:44	0.47269 kgCO2e/tonne.km	5.61	102	270

Difference	59
Total reduction in carbon emissions	278

CO_2e = carbon dioxide equivalent

Table 2: Financial impact of switch from 1:34 to 1:44 dialysis acid concentrate in a haemodialysis unit

Acid concentrate	**Cost of acid per item (£)**	**Estimated number of items required annually**	**Cost of acid annually (£)**
1:34 (1000L bulk)	420	25	10500.00
1:44 (1000L bulk)	500	19	9500.00
Difference			1000.00
1:34 (canister)	3	936	2808.00
1:44 (canister)	2.85	936	2667.60
Difference			140.40
Total financial saving			1140.40

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